FORESTRY

FRDA REPORT 052

THE STATUS AND DIRECTION OF THE TREATED LUMBER PRODUCING SECTOR IN BRITISH COLUMBIA

FOREST RESOURCE DEVELOPMENT AGREEMENT

Canada

BC

FRDA REPORT 052

THE STATUS AND DIRECTION OF THE TREATED LUMBER PRODUCING SECTOR IN BRITISH COLUMBIA

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SUMMARY

The treated wood products sector in BC is healthy and expanding. Its growth is spurred by the increasing importance of the residential shelter renovation and repair market, increasing awareness of the economic benefits of the commercial use of pressure treated wood and increasing acceptance of preserved wood foundations.

This report examines the treating industry in BC, the rest of Canada and the US in terms of its scale and the chemicals and processes employed.

Considering its scale, no one source of information is either comprehensive or timely, resulting in estimations and compromise between the various partial sources.

Estimated annual growth rate in demand for treated wood of 10-12%, experienced in the early 1980s is forecast to last well into the 1990s.

The value of treated wood products shipped from Canadian treaters has increased steadily from $81.4 million in 1976 to over $250 million in 1986. This apparent high rate of growth actually overstates the true growth, since the value of the input materials, especially the raw wood, also increased in this period.

Lodgepole pine treats well, but spruce is more difficult to treat. Concern is expressed that, when mixtures of pine and spruce are treated together, possible premature failure of the spruce may incur legal liabilities. Greater emphasis may be needed at the primary sawmill level to provide pure species sorts to overcome this concern.

While the use of waterborne salt treating systems in Canada is on the increase, creosote usage is on the decline.

Combining the preservation treating with fire retardant and insect repelling treatment could provide products for new markets and help overcome sales resistance in markets such as the UK wood framed housing.

Treating of wood not only enhances its longevity and appearance, it reduces its maintenance costs and lessens the threat of substitution by plastics and metals.

1
INTRODUCTION

The available options for the sustained viability of Canada's solid wood products sector are dwindling in number and, for reasons outlined below, must now focus on the umbrella theme of extracting more value from each product.

- Nearly full exploitation of Canada's forest resource.
- Recent overcutting of BC's Annual Allowable Cut by approximately 20%.
- Too much sawmilling capacity already in place in BC.
- Poor return on investment for most lumber producers.
- Growing threat from evolving forested countries, with lower production costs.
- Cyclical market demand and prices.
- Prices for most of BC's commodity lumber items, when measured in real terms (i.e. deflated dollars in Canadian funds), are on a declining trend.
- Continued decline in the employment potential, due to automation.
- Reaching the point of diminishing returns on many cost cutting capital investments.
- Lower strength values of lumber from Canada's second growth forest.

As the world demand for wood increases, it becomes increasingly important to make the best use of our forests and to extract greater value from its products. One way of expanding this resource is to prolong the life of wood products by protective treatments. A method of extracting greater value is through new applications of wood products, such as preserved wood (and plywood) foundations.

By extending the service life of wood in terms of appearance, safety and function treated wood can command a premium price and rewards its producers with higher margins of revenues over costs--hence more value.

Purchasers of treated wood products, be they Do-It-Yourselfers putting in a patio or fence, home builders, home owners or industrial users, are willing to pay premium price to receive the following advantages:

- Extended service life.
- Reduced maintenance costs and enhanced appearance during that prolonged life.
- Predictable performance in severe climates.
- An alternative to steel plastic or concrete, offering other benefits.
- An alternative to concrete as a foundation material offering improved insulation and, in certain locations, lower costs.

A listing of typical wood items which are treated in BC is:

- Lumber for residential and commercial uses
  - timbers
  - preserved wood foundations
  - exterior woodwork
  - exterior stairway
- Utility poles and cross arms (Canada has over 10 million!)
- Railway ties
- Plywood
- Shakes and shingles
- Fencing
- Poles, posts, rails
- Decking
- Garden furniture
- Playground equipment

Estimates of losses from biodeterioration of standing timber are higher than those from wildfire in the forest and, on occasions, exceed 20% in North American stands. The premature replacement of wood items and the reapplication of surface coating such as paint represents a large expenditure to both residential and industrial users. Fungi may also be responsible for extra labour and production costs when business activity is disrupted by replacement of timber that has deteriorated in service. Dissatisfaction with the visual or functional nature of wood products in service leads to its substitution by alternative materials such as plastics or metals.

Treating wood by impregnating it with preservative chemicals eliminates it as a food for fungi, termites and other insects and hence greatly prolongs its service life. The need for long lasting protection from wood destroying organisms is clearly proportional to the severity of the service exposure of the wood--for example:

- marine or exposed external applications;
- moisture contents exceeding 20%;
- wood in contact with the soil;
- continuous wetting from rain seepage, splashing, plumbing leaks and condensation;
- use of humidifiers in houses in winter.

In addition to extending Canada's timber resource, treatment plays a major role in retaining and recapturing markets previously lost to alternative materials such as concrete, metal and plastic.

Due to its increasing scarcity, straight, sound cedar or Douglas fir trees having the dimensions needed for utility poles/piles are increasingly expensive. By appropriate treating, other cheaper, but less durable species, such as hemlock, lodgepole pine and spruce, can be successfully substituted.

This report differentiates between "Protection"--defined here as the surface anti-stain treatment for use in-transit and the long-term "treatment" for service life extension. The subject of this review is long term treatment. Treated wood, for purposes of this report refers only to wood products that have been subjected to pressure or immersion under controlled conditions in order to impart additives that inhibit decay and extend service life. It does not generally include the processing of wood by means of simple immersion, coating, spraying or painting with wood preservatives. A minor part of this report relates to treatment to enhance fire resistance.

2
SIGNIFICANCE OF SECTOR

The Canadian Treated Wood Sector

Though the treaters in Canada represent a mature and well organized sector, they are difficult to quantify for a variety of reasons:

- Lack of a consistent or thorough time series of data from Statistics Canada. Changing data formats in recent years, along with confidentiality rules, severely limit their analysis.
- Mixture of units associated with volumes of differing products lumber, poles, plywood,etc.
- Many treaters also custom plane or dry or operate primary sawmills at the same facility hence confusing segregational data.
- Some treaters are custom operators and do not own or sell the products they are paid to treat.
- Confusion between the cost and value of the treatment, compared to that of the wood processing prior to treating.
- Conflicting information from various associations who attempt to estimate the total Canadian picture, based on an extrapolation of their own members.
- Difficulty in segregating the proportions of each of the chemical systems employed at a given facility.
- Mix of major and minor operators, some of whom may wish to suppress data for competitive reasons.
- Non-standardized formats of the trade publication annual guides.
- Lack of a Canada-wide grouping of provincial directories of the forest industries.
- Difficulty in defining the sector in volume treated terms.
- Biasing of the figures by the major traditional creosote-oriented tie sector.

In addition, the latest figures from Statistics Canada are for 1986 and, for a rapidly growing sector, are hardly relevant for investment decision making. Due to confidentiality rules, Statistics Canada publish very limited data on the sector by province, or production in terms of board (or square) footage.

Statistics Canada's most recent report of the treated wood sector is for 1986 and identifies 59 treaters having 1,490 total activity employees and shipping goods valued at over $250 million.

Growth in Value Canadian Treated Wood Shipments

Year	Number of Treaters	Number of Employees	Value of Goods Shipped $ Millions
1970	34	1,357	38.5
1971	30	1,448	45.5
1972	31	1,468	51.1
1973	33	1,452	60.5
1974	36	1,506	79.7
1975	36	1,627	88.2
1976	36	1,481	81.4
1977	34	1,474	101.9
1978	38	1,733	119.7
1979	41	1,672	132.2
1980	40	1,687	150.2
1981	43	1,572	168.5
1982	45	1,388	165.7
1983	47	1,249	170.5
1984	50	1,443	235.6
1985	51	1,348	213.8
1986	59	1,911	250.2

Source: Statistics Canada Cat #35-250B, Cat #35-208

Treated Wood - Provincial Statistics

	1984		1985		1986	
	# Treaters	# Employees	# Treaters	# Employees	# Treaters	# Employees
BC	---	344	17	417	19	455
Alberta	---	189	11	203	10	204
Saskatchewan	---	84	5	91	5	98
Manitoba	---	---	2	---	2	---
Ontario	---	486	8	230	13	349
Quebec	---	---	3	---	5	181
New Brunswick	---	---	2	---	2	---
Nova Scotia	---	---	2	---	2	---
Newfoundland	---	---	1	---	1	---
Canada	**50**	**1,443**	**51**	**1,348**	**59**	**1,911**

Source: Statistics Canada Cat. #35-250B SIC #2591, Cat. #35-208

The Canadian treated wood sector shows a significant rate of growth in both the value of goods shipped, and in the total value added.

Treated Wood - Canadian Statistics
- Production Cost and Values

$Million

	Cost of Production							Value	
	A Fuel and Electricity	%	B Total Labour	%	C Material and Supplies	%	A+B+C Total Cost	Goods Shipped	Total Value Added
1975	2.1	3	18.6	25	53.5	72	74.2	88.2	37.0
1976	2.2	3	18.0	26	48.7	71	68.9	81.4	34.1
1977	2.3	3	20.7	26	57.6	71	80.7	101.9	39.8
1978	2.6	3	25.0	26	68.9	71	96.6	119.7	48.4
1979	3.1	3	26.8	24	81.9	73	111.9	132.2	52.3
1980	3.2	3	30.8	24	93.6	73	127.6	150.2	58.8
1981	4.2	2	32.1	23	106.3	75	142.6	168.5	62.4
1982	5.7	5	30.7	22	100.4	73	136.7	165.7	61.5
1983	5.3	4	29.4	20	111.2	76	145.9	170.5	55.8
1984	6.7	3	37.5	19	153.7	78	197.9	235.6	78.0
1985	5.6	3	35.8	19	150.4	78	191.8	213.8	65.9
1986	5.8	3	28.1	14	173.7	84	207.6	250.2	77.7

Source: Statistics Canada Cat #35-205 (1975-81)
Statistics Canada Cat #35-250B (1982-86)

Product S.I.C. #2591

Similarly, the magnitude of the value added for employee in the Canadian treated wood sector shows consistent growth.

Value of Treated Wood - Canada

	Value of Goods Shipped - Million	Number of Total Activity Employees	Ratio: Value Shipped per Employee ($)
1980	150.20	1,687	89,030
1981	168.5	1,572	107,180
1982	165.7	1,388	119,380
1983	170.5	1,249	136,509
1984	235.6	1,443	163,270
1985	213.8	1,348	158,605
1986	250.2	1,490	167,920

Source: Statistics Canada Cat. #35-208, Cat. #35-250B

Note that while 1986 contained a 20 week IWA strike period, this apparently had little overall impact on the treated wood sector.

The value of goods shipped per total activity employee in the Canadian treated wood sector has nearly doubled from $89,030 in 1980 to $167,920 in 1986.

The limited data available from Statistics Canada regarding the value and proportions of the chemicals used in treating indicate that, of the period 1981-84, while creosote use has declined from $4.5 million to $3.8 million, penta/oil increased from $6.9 million to $10.4 million and other chemicals also increased from $7.2 million to $10.2 million.

Value of Treating Chemicals Used in Wood Treatment in Canada
($ Million)

	Creosote Oil	Penta/oil	Other Treating Chemical
1981	4.5	6.9	7.2
1982	4.0	8.5	7.2
1983	3.9	6.2	8.0
1984	3.8	10.4	10.2
1985	2.5	n.a	n.a

Source: Statistics Canada Cat. #35-208 SIC #2591

The trade associations representing both Canadian and US treaters are listed in Appendix 1.

The US Treated Wood Sector

As with the Canadian treated sector, data on the US treating sector tend to be out of date or incomplete as they are sourced by particular interest groups such as trade associations or chemical suppliers.

In 1985 the American Wood Preservers Association reported the following data:

- In the US there were 577 treating plants, of which 560 were pressure treaters, owned by 448 companies.

- An estimated 519.3 million cubic feet of wood product were treated as follows:

	Volume (million cubic feet)	%
Creosote	128.6	25
Penta	52.5	10
Waterborne	328.7	63
Fire Retardant	9.5	2

- Number of US treating plant employing:

Creosote	101	
Penta	86	(72 pressure, 14 non pressure)
Waterborne	378	
Fire Retardant	69	

- Production of treated wood in the US, 1985 in thousands of cubic feet

	Volume Treated With				
Products	**Creosote**	**Penta**	**Waterborne**	**Fire Retardants**	**All Chemicals**
Crossties	85,578	316	--	--	85,894
Switch & Bridge Ties	8,134	--	--	--	8,134
Poles	17,850	45,727	13,254	--	76,831
Piling	5,685	230	4,614	--	10,529
Fence Posts	1,617	1,523	9,296	--	12,436
Lumber	3,623	1,703	249,521	5,548	260,395
Timbers	3,763	1,149	24,296	--	29,208
Plywood	--	63	5,223	3,060	8,346
Other Products	2,319	1,823	22,474	924	27,540
All Products	**128,570**	**52,535**	**328,677**	**9,532**	**519,315**

- Estimated US production:

	Lumber (million board feet)	Timbers	Plywood (thousand sq.ft. 3/8")
Waterborne	4,283.6	348.1	167.1
Creosote	47.0	47.9	--
Penta	24.3	15.7	2.0
Fire Retardant	94.0	--	97.9
Total	**4,450.0**	**411.7**	**267.1**

- Rate of growth of the US treated wood sector:

	Percentage Changes	
	1985 over 1984	1986 over 1985
Lumber	+8.1	+29.6
Timber	+8.0	+24.2
Plywood	+48.4	+32.4

Based on reported volumes treated

An estimated six billion board feet of Southern Pine lumber was treated in 1987. Both the Southern Pine Inspection Bureau and the Southern Forest Products Association report that last year's Southern Pine treated output increase about 20% from the roughly five billion board feet treated in 1986.

Approximately 80-90% of the lumber treated in the US last year was Southern Pine.

The 286 members of the American Wood Preservers Bureau treated 3.3 billion board feet of lumber in 1987. This is an increase of 13% from the 2.9 billion feet treated by 289 plants in 1986. A decade ago, AWPB plants treated 733 million feet. In 1982, AWPB output was 1.7 billion feet, just over half of 1987's total. Treated lumber output by the 120 plants using the SPIB quality mark was estimated at 2.5 to 3 billion feet last year.

3
OUTLINE OF THE TREATERS IN BC

Outline of the BC Treated Wood Sector

Available data on the BC treated wood sector are very limited. Latest Statistics Canada data, for example, are for 1986, do not report volumes treated or methods employed and, due to confidentiality guidelines, report very little data by province.

BC's treaters are listed in Appendix 2.

BC's treated wood sector in 1986 employed 455 total activity employees at 19 treaters and shipped goods valued at over $19 million.

While BC's primary sawmill sector dominates all other provinces in scale and productivity, only in the past 3 years has BC exceeded Ontario in terms of number of treaters or employees.

An inter-provincial comparison is as follows:

Inter-provincial Comparison

	Value of Goods Shipped ($ Million)				Number of Total Activity Employees			
Year	1985	% Total	1986	% Total	1985	%	1986	%
BC	61.0	29.0	62.0	25.0	417	31	455	31
Alberta	25.6	12.0	27.3	11.0	203	15	204	14
Saskatchewan	7.7	3.6	10.1	4.0	91	7	98	7
Manitoba	--	--	--	--	--	--	--	--
Ontario	46.3	21.7	80.2	32.0	230	17	349	23
Quebec	n.a	--	23.7	9.4	n.a	--	181	--
New Brunswick	--	--	--	--	--	--	--	--
Nova Scotia	--	--	--	--	--	--	--	--
PEI	--	--	--	--	--	--	--	--
Newfoundland	--	--	--	--	--	--	--	--
Total	213.8	100.0	250.2	100.0	1,348	100	1,490	100

Source: Statistics Canada Cat. #35-250B, Cat. #35-208

Note: Lack of Canada-wide reporting
Absence of pre-1985 data

4
BACKGROUND TO TREATMENT

Mechanism of Decay

Structures built of wood such as houses and ships have endured for centuries, while others develop decay or termite problems within a relatively short period of time. The same biological degraders that decompose dead trees in the forest also threaten its serviceability in structures. However, wood will last for centuries if one of four elements required for decomposition is eliminated:

- moistures;
- oxygen;
- food source;
- favourable temperature.

Three dominant systems degrade the service appearance and longevity of wood:

1. Fungus

One of the common wood destroying organisms is fungus. Fungi are plants which lack chlorophyll and can be divided into two major groups:

- molds which discolour wood, but have very little effect on its strength;
- decay fungi which will decompose wood under moist or very humid conditions.

Fungi are the chief cause of the biodeterioration of wood. They cause deterioration of wood in two distinct methods:

- Using only the food stored in the wood--such as moulds and sapstains--and causing unsightly discolouration.
- Attacking the cellulose or lignin (termed wood destroying fungi) ultimately dissolving the wood and weakening the structure.

2. **Bacteria**

Bacteria are also responsible for deterioration of both standing timber and wood products.

3. **Insects, termites, marine borers, beetles, etc.**

Forintek is developing chemical treatments involving boron to eliminate insect attack as this treatment is becoming mandatory in the U.K. timber framed housing market.

Treatments

The two common methods of enhancing the serviceability of wood are:

1. **Kiln Drying**

The most widespread method of wood preservation employed is that of kiln drying. Wood with a moisture content of less than 20% and subject to an operating environment of less than 20% is not prone to decay. In consequence, lumber and plywood standards specify "less than 19%" moisture content, and generally require redrying after liquid preservation processes. Wood, however, is hygroscopic and, once dried, it retains the ability to absorb liquid water or water vapour and hence has a tendency to decay. Hence for severe service applications kiln drying becomes inadequate.

2. Treating with chemical solutions, generally employing pressure and incising to enhance penetration of chemicals into the surface of the wood.

The longevity and effectiveness of the treatment depends on a large number of interrelated factors including:

- appropriateness of the preserving chemical to the properties of the wood species;
- severity of the service environment and engineering design application;
- uptake and retention of the preserving chemical, preventative maintenance of the wood during its service life and depth of preservative penetration;

The depth to which the preservative penetrates the wood is in turn subject to a wide variety of influences including:

- Natural permeability of the cell structure of the wood in its 3 axis.
- Osmotic forces proportional to relative wood and treatment chemical energy levels and the relative liquid pressures.

Mechanical Incising

Incising the surface of the wood using spiked rollers or needles increases its surface area and enhances the uptake of chemical. The degree of incising is limited by mechanical damage to the important surface fibres, and by appearance. Forintek is developing a very fine toothed roller to permit a high density of penetration with a minimum of surface visual downgrading.

Needle Incising

Traditional spiked roller incising visually down grades the surface of the lumber and, when the spikes are applied too close to the edge, tends to create splits. Needles, however, cause considerably less surface damage and permit deeper penetration.

Needles have to be forced vertically into the surface of the wood using a press and cannot withstand the bending forces associated with the motion of a needle spiked cylinder rolling along the surface of the lumber. In consequence, a major disadvantage tends to be the relatively slow lineal throughput of this interrupted throughput. Breakage of the needles, largely due to striking knots, is another limitation of needle incising.

P.H.B. Weserhutte of West Germany offer patent protected needle press incising equipment, however the licensing arrangements have not yet been made to permit its use in Canada.

Laser Incising

As an alternative to mechanically incising using spiked rollers or needle presses, one system employs lasers to vaporize wood in the desired configuration of pattern and depth. Laser incising minimizes the rupturing and compaction of fibres adjacent to the cavity, produce less visual downgrading, permit easy selection of appropriate pattern and depth combinations and is unaffected by dense knots.

Kootenay Wood Preservers at Cranbrook are pioneers in the application of this development. The method however suffers from it's low throughput and the high capital cost of the equipment.

Water Jet Incising

Eroding the cavity with a jet of very high pressure water (or water containing an abrasive or with the treating chemical) has been researched, though no commercial application is known. Weyerhaeuser research laboratory in Tacoma is exploring this technology, however it too is slow and employs expensive equipment.

The Treating Process

Each of the chemical systems employs different treating processes. In addition, differing wood species and desired levels of chemical uptake requires alternative processing schedules.

Basically the wood, suitably stickered to permit exposure, is loaded onto carts and is wheeled into a retort cylinder. Combinations of vacuum and pressure are employed and the treating chemical is introduced.

Section 5 of this report details the treatments employed.

Kiln Drying after Treatment (KDAT)

Seasoning after pressure treatment is necessary to reduce the moisture content of the wood after treatment to 19% or less, to ensure quality products.

The waterborne preservative methods may necessitate kiln drying after treating. Most treating facilities have dry kilns and have a probable cost of custom drying of approximately $35-45 per thousand.

Advantages of KDAT

- Reduces shipping weights by up to 30%.
- Can improve product appearance.
- Enhances paintability.

Disadvantages of KDAT

- Often difficult to cost-justify--drying cost normally exceed freight savings.
- Can cause split end and crook.

Retention of Chemicals

Clearly the greater the uptake of chemical, the more severe the service application or the service life can be. The cost of chemicals, however is proportional to the retention.

Certain species, notably lodgepole pine, hemlock and southern yellow pine, absorb treating chemicals readily and without time consuming or costly processing.

The required standards and type of treatment for various service applications are dictated in the grade stamp authority specifications. These specifications also define the uptake of the chemical in terms of the pounds of uptake per cubic foot.

A typical treatment penetration of 10 mm (0.4 inches) is general for the CSA standard for ground contact.

At present spruce lumber does not meet the CSA penetration requirement for use in ground contact. This resistance to penetration is largely attributable to the cell structure and to the small pit (hole) sizes in those cells. Two methods of enhancing the treatability of spruce are being researched, pre treatment using high density fine toothed incising and the accelerated thermal diffusion treatment system.

A quality control concern exists where BC mixture of spruce and pine are permitted to be treated simultaneously, yet have markedly different chemical uptakes.

Product Testing

Accelerated Aging Simulation in the Laboratory

In order to accelerate the effects of specified service environments on treated wood, government sponsored laboratories and private chemical supply companies subject reduced scale samples to standardized test procedures in climate controlled chambers. By deliberately selecting those combinations of temperature, humidity, oxygen and food supply which encourage fungal growth, accelerated service condition can be simulated. By providing fungi with an ideal environment for growth 24 hours per day, these chambers--called "FABS" (Facilities for Accelerated Biodeterioration) can accelerate the natural rate of decay by up to twenty times. Correlation factors, developed over time, permit true service performance to be estimated.

Field Test Sites

On a longer time scale it is necessary to test the durability of full scale samples in actual service conditions using field test sites. Forintek, for example, operates test facilities at Haney and Westham Island, BC and Chalk River and Ottawa, Ontario for items such as utility pole,fence posts, siding, decking, window joinery, shakes and shingles and plywood. For marine environment testing Forintek operate test sites in West Vancouver, BC and Shediac Bay, New Brunswick.

Treatment Codes and Standards

The Canadian Standards Association have developed a series of standards and specification designed to ensure the end users that the wood is adequately treated and is appropriate for defined uses. The standard is CSA 080 and is outlined in Appendix 3.

A significant limitation exists in the possible export of Canadian treated wood to the U.S. marketplace. While the treatment chemicals and processes may be identical in Canada and the U.S., no reciprocity exists in the acceptance of the other countries codes, standards, inspection methods or treatment grade stampings. This is largely due to the lack of common or a national grading systems for treated wood. Work is underway by the Canadian Wood Preserves Bureau CWPB to recify this. Initially it is necessary for Canada to develop a national grading system for treated wood in which techniques and quality control checks are developed and demonstrated to U.S. counterparts. Only after testing and acceptance of Canadian treated and grade stamped wood in the U.S. could it be effectively marketed there.

As a result of the lack of reciprocally accepted and grade stamped treated wood products, U.S. southern yellow pine dominates the U.S. treated market.

Identification of Treated Wood

Most treaters grade stamp markings indicate:

- the grading authorities name;
- the preservative employed;
- the quality standard;
- the trademark of the agency supervising the treater;
- the treating company and the plant location;
- the year of treatment;
- proper exposure conditions.

Canada's Central Mortgage and Housing, CMHC, while providing relatively little actual money for housing (mortgage money mainly comes from banks, trust companies, etc.), does act as a datum by which acceptable design and material selection are approved and broadcast. "Buyer Beware" still applies, however, to the selection or otherwise of life enhancing treated wood products--especially in exterior and "do-it-yourself", DIY, items such as patio decks and fences.

Building codes and standards for residential structures, while fostering safe and well proven design practices, tend to set minimum acceptable limits, rather than focussing on life and investment enhancing practices.

Species Sorting Concerns

While lodgepole pine treats well and meets the CSA requirement for 10 millimetre (0.4 inch) penetration needed for ground contact applications, spruce does not. Not only does spruce have a different rate of chemical uptake from other species due to its cell structure, but spruce lumber tends to be composed of the drier heartwood and is hence less treatable. Treated spruce is prone to splitting and checking and this problem needs rectification.

Obtaining a pure pine sort poses additional processing costs and cannot guarantee perfect separation.

Question:

By permitting some spruce in the predominantly pine sort for treating, does the possible premature service failure of the spruce proportion pose a major industry wide legal liability?

Legal Implications of the Life Warrantee

Difficulties have arisen in the interpretation and administration of life warrantees offered, including:

- where grade markings have become illegible with time;
- where treaters have ceased operation;
- interpretation of what actual service exposure conditions existed;
- conflicting municipal, provincial or federal codes and standards;
- exposure conditions which changed with time--for example, where the original provisions for drainage failed;
- assigning liability between the treater and the builder;
- determining fair financial recompense.

None of the warrantees offered really gives sufficient or lasting information to ensure that the purchaser (or subsequent property owner) gets the full benefits of legal recourse offered.

American Standards

The American Wood-Preservers' Association (AWPA) issues treatment standard which specify the quality of the various preservatives, the quantities, and the penetrations required to protect wood for different end uses.

The American Wood Preservers Bureau (AWPB) issue quality control standards for pressure treated lumber and plywood. The AWPB program is patterned after the well established lumber grade market system. The AWPB quality mark on each piece of pressure treated lumber and plywood is the consumer's assurance that the treatment complies with established standards. An example of a US standard for alternative service exposure is shown in Appendix 4.

5
ALTERNATIVE TREATMENTS

Selection of appropriate chemical treating systems and the method of application/ impregnation is complex and beyond the scope of this industry sector review.

A summary of the chemicals employed in treating and their trade names are shown in Appendices 5 and 6.

A summary of the CSA recommended end use guide for the various treatments is shown in Appendix 7.

The large volume of creosote treated railway ties--the traditional but "low tech" treatment--represents about one half of the volume of wood treated. This, however, biases the statistics and diverts attention way from the higher value uplift to be obtained from "higher tech" treating of more widely employed lumber product.

There are a number of different preservatives used in the pressure treatment of wood in Canada which may be broadly classified into three groups:

1. Waterborne chemical formulations, consisting of inorganic compound dissolved in water as a carrier. The water later evaporates, leaving the preservative chemicals fixed in the wood.

2. Oilborne chemical formulations, consisting of an organic preservative dissolved in a suitable petroleum oil carrier.

3. Creosote or creosote mixtures. If used in a mixture,creosote is usually blended with petroleum oil.

Suppliers of these chemicals either offer a range of products covering each of these classifications, or tend to market and aggressively defend their more exclusive focus.

Costs for waterborne salt treatments tend to be lower in terms of chemicals, energy and capital than in the creosote or penta systems. In consequence, the most rapid growth rate is experienced in the waterborne salt sector. The popularity of copper chromated arsenate (CCA) and ammoniacal copper arsenate (ACA) is also due to the marketing and trade name franchising approach of the salt suppliers and the increasing cost of products in substitute materials in selected applications.

Creosote treatment is losing its relative market position due to the limited growth opportunities of its traditional markets (utility poles and ties), the increasing cost of oil derivatives and its comparatively higher processing costs.

The following summarizes three major treating chemicals and is intended to be a guide only.

Waterborne Preservative Chemicals

The two most commonly used waterborne preservatives in Canada are CCA and ACA, commonly classed as salt formulations. These are mixtures of stable oxide dissolved in water.

CCA was first patented as a wood preservative in England in 1934 and in the ensuing fifty years its formulation has been further tested and developed. The preservative is a mixture of oxides of copper, chromium and arsenic, blended in precise proportion.

ACA, discovered at the University of California in the mid 1920s is an aqueous solution of copper arsenate, utilizing ammonium hydroxide as a solvent for the copper. During drying following pressure treatment, the ammonia evaporates leaving the solidified copper arsenate deep in the wood.

Each element in these preservatives is important to the overall performance. Copper, in combination with certain other elements is an effective fungicide. Inorganic pentavalent arsenate is toxic to wood destroying insects. The chemical reactions which fix the CCA and ACA preservative in the wood are quite complex. In general terms, the metallic oxide are reduced by wood sugars to form high insoluble, leach-resistant precipitates. The precipitates are fixed in the wood and are non volatile; they will not vaporize or evaporate. The wood is, therefore, rendered useless as a food substance for wood destroying insects and organisms. Additionally, the copper in the preservative deters formation of moss on the treated wood surface.

The pentavalent arsenic compound is not to be confused with the very toxic trivalent arsenic. It is a naturally occurring trace element present in soil, water, air, plants and in the tissues of most living creatures. The insoluble arsenate precipitate is not harmful to man or animals in the normal concentrations found in waterborne preservative treated wood products.

Copper Chrome Arsenate

Uses

- Preserved wood foundations
- Railway ties
- Utility poles, piles, posts, piling
- Laminated wood beams
- Siding, roofing, panelling
- Industrial sheathing and roofing
- Fencing, patios, stairways
- Outdoor furniture
- Retaining walls

Advantages

- Suitable for use in building construction
- Cost competitive
- Over 50 years of safe service experience
- No additional combustibility
- Pleasant green finish
- Clean to apply and handle
- Alternative natural colour finishes available
- Non-oily finish
- Can take a paint finish
- No smell
- Salt forms insoluble links with cellulose, effectively stabilizing them.

Disadvantages

- Not all wood species can be treated satisfactorily, i.e. Douglas fir is treatable but more difficult than pine, spruce is even more difficult to treat.
- Conducts electricity
- Additional cost and difficulty in preventing chemical solution from freezing during treating at sub zero temperatures.

Ammoniacal Copper Arsenate ACA

Generally comparable to CCA however:

Advantage

- With a minimum of conversion costs, ACA can be employed using penta process equipment

Disadvantage

- Mottled appearance often incorrectly associated with variable quality treating.

- Lesser marketing effort by ACA suppliers leads to less market place awareness and hence less demand.
- Conducts electricity

Oilborne Chemicals

Pentachlorophenol, or "penta", is a widely used and accepted oilborne chemical preservative. Penta pressure-treated wood is highly resistant to fungi and insect attack.

Penta is a crystalline chemical compounded formed by the reaction of chlorine and phenol. It has a very low solubility in water, but is relatively soluble in most high-boiling petroleum oils and some other solvents. In Canada, usually 5% penta by weight is mixed with a petroleum satisfying the requirements of CSA 080.201-M.

Penta was first produced experimentally for use as a wood preservative in the United States in the early 1930s. Commercial use began in 1934. By 1953 it was in sufficient use to be reported by the American Wood Preservers' Association, and since then penta has grown in popularity.

The Chlorophenate Family

Uses

- Utility poles
- Timber cribbing
- Fencing
- Pole buildings
- Exterior stairways
- Garden furniture

Advantages

- Highly effective in preventing attacks of fungi and insects
- Effective above or below ground
- Easy to apply

- Does not mar appearance
- No smell
- 45 years of service experience
- Non-corrosive to metals.
- Treated wood offered in colours from light straw to dark brown.

Disadvantages

- Increasing resistance in the market place due to health/environmental concerns
- Unsuitable for use in building construction
- Toxic to plants
- Flammable
- Not effective for use on structures immersed in salt or brackish water
- Not effective against marine borers

Creosote

Creosote is a distillate of coal tar produced by the high temperature carbonization of butuminous coal. Containing over 160 compounds, creosote is primarily composed of liquid and solid aromatic hydrocarbons as well as some tar acids and tar bases, which provide protection against destructive insects and organisms.

Creosote pressure treatment of wood was patented in the UK in 1838; it was first used in Canada in the early 1990s.

Treatments derived from creosote include creosote-petroleum mixtures and napthenates.

Uses

- Railway ties
- Poles, posts, pilings
- Fencing
- Utility poles

Advantages

- Highly effective against wood destroying agents including marine borers
- Proven in over 150 years of use
- Cheap
- Widely available
- Viscous lubricant qualities help protect against physical damage
- Safe for DIY
- Non conductor of electricity
- Recoating easy for DIY
- Enhances water repellency
- Reduces splitting and cracking
- Limits corrosion of metal fasteners

Disadvantages

- Unsuitable for use in interior building construction
- Ugly black/brown mottled finish
- Messy to apply and to contact in service
- Very smelly
- Toxic to plant and animal life
- Tendency to ooze in warm weather
- Flammable, especially when repeated coatings applied.

6
PRESERVED WOOD FOUNDATIONS, PWF, HOUSING

History of PWF's

In 1961, the first true PWF house (called "Mark III") was built, employing creosote treated wood. In 1964, a penta/oil treated wood house was built. Problems with smell and bleed through resulted in the building in 1967 of two CCA PWF houses in Alberta, sponsored by the BC Plywood Manufacturers Association. Since then, PWF houses have increased in popularity, especially in colder more remote locations and CCA has been employed exclusively.

Popularity

Though the actual numbers of PWF houses is still small, the rate of increase, in a relatively static housing market place like Canada's is more dramatic.

Figures indicate that the present PWF housing rate over 15,000 houses per year compare to 10,000 in 1981.

Estimated Preserved Wood Foundations Installed

Year	Total Housing Starts	PWF Units*	Percentage PWF
1975	231,456	1,500	0.6
1976	273,203	2,000	0.7
1977	245,724	2,371	1.0
1978	227,667	3,895	1.7
1979	197,049	6,379	3.2
1980	158,601	6,413	4.0
1981	177,973	8,113	4.6
1982	125,860	6,348	5.0
1983	162,645	11,605	7.1
1984	134,900	5,553	4.1
1985	165,826	10,601	6.4
1988e	200,000e	15,000*e	7.5e

Also, it is estimated that an average of 1.12 MSF (3/8" basis) of treated plywood and 2.3 Mfbm of treated lumber are used in an average PWF.

Source: Canadian Institute of Treated Wood

* Estimate sourced: Nick Rebalski, Vancouver Sun, July 16, 1988 Page D1

PWF Chemicals

Two preservatives are approved for use in Canadian PWF, CCA and ACA. Due to economics, all Canadian builders only employ CCA.

Canadian Standards Association standard #080-15 covers details of PWF's.

PWF Economics and Advantages

The cost of a typical house with a cement foundation is generally similar to PWF. However, the proximity of a cement batch plant, or of a contractor familiar with PWF construction, may be sufficient to bias a regional cost advantage to favour one or the other method.

Advantages cited for PWF over concrete includes:

- thermal efficiency is superior to concrete, hence has advantage in colder climates;
- easier to insulate between the studs and does not require an interior wood pony wall;
- dry wall can be nailed directly onto studs, eliminating furring using cartridge fired nails;
- generally faster construction, especially with prefabricated PWF panels;
- uses the same carpentry skills employed to frame the rest of the house;
- no cracking due to settlement;
- cost competitive in rural areas, where cement batch plants are not accessible;
- permits construction during below-freezing temperatures.

PWF Building Codes

Building codes in Canada require that house foundations penetrate beneath the frost free depth to prevent heaving in winter. The traditional 2-level home in Canada employs a below-grade basement level built using formed (cast in place) concrete or blocks of concrete for floors and walls. Preserved wood foundations (PWF) employ treated wood with a plywood sheathing instead of concrete. While the soil directly contacts the PWF, drainage systems employing pebbles and drainage pipes are always specified.

7
MARKETS, SUPPLY/DEMAND, AND ECONOMICS

Market for Treated Wood

BC treaters see the do-it-yourself market, homebuilding and commercial construction, in that order as the principal areas for end-use growth. Areas of rapid growth in treated wood cited are:

* DIY and home repair and renovations such as decks and patios.
* PWF

A medium rate of growth is forecast by BC treaters for treated residential and non-residential framing, landscaping or fencing.

To a much lesser extent, increases in the agriculture, truss plants, manufactured housing, public recreation and industrial markets are forecast.

Fire retardant treatment, with the exception of shakes and shingles, is not seen as being a major growth sector.

Changes in Treated Wood Markets

The last 20 years have witnessed a significant change in lifestyle which focusses on using garden space for social recreation. This places emphasis on homes having maintenance free, attractive outside decks, barbecue and garden furniture, porches and other exterior weather exposed structures. At the same time, two other changes have occurred; do-it-yourself home projects for amateur homeowners and the desire for lasting quality--reinforced by the proven investment benefits incurred. These product types favour the water soluble salt CCA/ACA treating systems. Penta, which is efficacious and can be re-applied to bolster its protection, may also bring environmental concerns.

Offsetting growth in the waterborne salt sector two major volume sectors, railway ties and utility poles/construction piles are facing not only competition through replacement of creosote with CCA but also rapid technological changes. Substitution by reinforced concrete, plastic or metal has reduced their traditional markets. Stagnation in new railway line building has reduced demand for ties to close to that of maintenance replacement only. Changes to telephone technology, involving increased use of microwave or underground fibre optics, has also reduced demand for poles. Cost, combined with lack of appropriately sized logs for piles, has permitted sheet and tubular steel piles to encroach that market.

8
FUTURE OPPORTUNITIES, METHODS AND CONCERNS

Future Opportunities

Fire Retardant Treatment (FRT)

Market Potential

Combining value enhancing treatments for both longevity and fire resistance is logical yet widely overlooked opportunity. No information is available from key data source such as Statistics Canada on the FRT sector.

The reluctance of a key potential export market for construction lumber and plywood, the UK, to adopt the predominantly wooden house in largely attributable to a misconception regarding its fire hazard. Erroneous, but widely accepted, adverse publicity regarding flammability of wooden structures along within entrenched attitudes and aggressive marketing by brick, stone and concrete suppliers has severely undermined attempts to have wood construction accepted.

Leach resistant commercially available FRT chemicals include:

- dicyandiamide/phosphoric acid
- guanidine
- melamine
- urea

Advantages of FRT

- Image enhancement/market acceptance
- Niche market sector/products enhancement such as homes for the elderly or the handicapped or for baby cribs.

Disadvantages of FRT

Possible:

- Tendency to leach, especially in exterior applications.
- Strength reduction.
- Enbrittlement
- Reduction in the allowable design stresses
- Hygroscopicity (increased uptake of moisture in humid environments)
- Reduction in glueability
- Reduction in paintability

Codes and Standards for FRT

Fire retardant chemicals are also applied under the same controlled conditions as the general wood preservatives and are covered under the same CSA 080 specifications. Performance ratings of fire retardant treated wood products for flame spread, fuel contributed and smoke developed are in accordance with the Underwriters' Laboratory of Canada (ULC) rating procedures.

Typical Areas of Future Research

- Importance of retreating treated lumber which has been sawn during construction.
- Correlation of treatment performance with time for standard preservatives varying levels of chemical uptake (depth of penetration).

- Relative performance of incised, unincised and combinations of incisor patterns and penetrations.
- Event, not time released, additives.
- Radiation treatments.

Future Concerns

Long Term Environmental Concerns

The chemical systems employed in wood treatment have been subject to intensive research to determine possible adverse health effects. The major areas of concern focusses on:

- the mill employees applying the treatment;
- disposal of surplus chemicals at the treatment site;
- handling of the treated wood at the construction site;
- disposal of trim ends from the construction site;
- longer term impact on residents of the structure;
- adverse chemical reaction should that structure catch fire;
- eventual disposal of the structure.

As an example of increased resistance to chemicals which may pose a threat to mankind and the environment, Sweden has banned the use of the chlorophenate family as a wood treatment/preservative. Also both Japan and West Germany have made several attempts to ban the importation of wood treated with chlorophenates. Dioxins, regarded as highly carcinogenic and toxic are present in minute quantities in both pentachlorophenol and tetrachlorophenol, resulting from their manufacturing process.

As an example of the environmental concern, a safe intransit surface protection was recently developed in BC by Dr. Suezone Chow's research team at Canfor. It employs a formulation of low hazard chemicals such as borax, and alkali. This protection has been employed on all Canfor's exported lumber to the European and Japanese markets for the past 14 months with satisfactory results. This formulation is ready for wider commercialization.

The Real Threat: Substitution

The ultimate threat facing the wood products industry is not competition from other wood products manufacturers, but from substitution by other materials into wood's traditional arena.

By offering extended lifetimes and written guarantees, substituted materials such as concrete, metal and plastics have been permitted to make successful inroads into wood's traditional markets.

Marketing campaigns for those substitution products stress exactly those positive attributes offered by treated lumber products namely:

- longevity, backed by warrantee;
- covered by codes and standards;
- predictable service performance;
- low risks due to premature failure;
- low maintenance costs in service;
- attractive appearance;
- life extension by in-field application of coatings;
- choice of colour finishes.

Examples of where the beginning of the potentially irreversible substitution process has made inroads into treated lumber's traditional market place include:

- concrete utility poles;
- steel for lighting masts, sign posts;
- sheet steel for structural piling;
- concrete blocks for harbour and river pilings, piers, etc.;
- vinyl or aluminum for window frames, house siding, soffits, gutters, down spouts;
- reinforced concrete railroad ties;
- concrete landscaping interlocking blocks;
- galvanized steel for roofing tiles;
- steel for large scale flumes, pipes, conduits, ducts, etc.

APPENDIX 1
ORGANIZATIONS INVOLVED IN WOOD TREATMENT

1. Canadian Institute of Treated Wood
   Ste. 506-75 Albert Street
   Ottawa, Ontario K1P 5E7

   Executive Director: David G. Milton
   Phone: (613) 234-9456

2. Canadian Wood Preservers Association
   PO Box 401
   Port Credit
   Mississauga, Ontario

3. University of British Columbia
   Industrial Chair in Wood Preservation
   Dept. of Wood Science

   Dr. John Ruddick
   Phone: 228-3736

4. Forintek Canada Corp.
   6620 NW Marine Drive
   Vancouver, BC

   Dr. George Rosenberg Phone: 224-3221
   Dr. Roger Smith
   Dr. Paul Morris

5. American Wood Preservers Institute
   Ste. 405-1945 Old Gallows Road
   Vienna, Virginia 22180

   President: Dr. Robert G. Smerko
   General Counsel: Walter G. Talarek
   Phone: (703) 893-4005

6. Society of American Wood Preservers Inc.
   Unit P - 7297 Lee Highway
   Falls Church, Virginia 22042

   President: George Eliades
   Vice President: Richard F. Catchpole
   Phone: (703) 237-0900

7. American Wood Preservers Association
Box 849
Stevensville, Maryland 21666

Secretary Treasurer: John D. Ferry
Phone: (301) 643-4163

8. American Wood Preservers Bureau
Box 5283
Springfield, Virginia 22150

President: Charles E. Thomas, Jr.
Vice President: Byong Ick Min
Vice President: Donn Keefe
Phone: (703) 339-6660

9. Western Wood Preservers Institute
Box 2913
Vancouver, Washington 98668

President: William Bond, Jr.
Vice President: Steve Ryan
Phone: (206) 696-4007

APPENDIX 2
WHO TREATS WOOD IN BC?

Company - Contact	Location	# Empl	Products	Treating System	Quantity per shift	Species	Market
A & A Post and Rail - Ken Arksey	Kamloops	14	Lumber, posts, ties, props, timbers, poles, rails	CCA C-50	35 M 2500 posts	100% LPP	USA
BCFP - Ashcroft Treating - Don Adamski, Dave Worthy	Ashcroft	--	Ties, timbers, posts poles, piling	creosote, creosote/petroleum	---	Douglas Fir, LPP Hemlock	--
Brisco Wood Preservers Ltd. - George Lautrup	Brisco	16	Lumber, posts, poles, timbers, wood foundations, plywood	CCA	56 Mfbm	50% pine 25% spruce 25% fir	--
BC Clean Wood Preservers Ltd. - R.W. Silcox	Surrey	40	Lumber, PWF, shakes and shingles, poles, piling plywood timbers	CCA C-50	12,500 cu. ft./day		
Canada Cedar Pole Preservers Ltd. (-Affiliate of B.J. Carney Co. Ltd.)	Galloway	10	Poles, piling	Thermal, penta	--	50% cedar and 50% LPP	--
Decker Lake Forest Products Ltd.	Burns Lake	--	Utility poles, piling lumber	CCA	--	LPP	--
Domtar Wood Preserving Division - J.C. Boyle	New Westminster Burnaby Prince George	50 -- 35	Utility poles, timbers lumber	pressure, creosote creosote/petroleum penta, chemonite	--	--	--
Everwood Trading Ltd. - Harry Nielson	Cloverdale		Poles, posts, rails	CCA	--	75% pine 12% fir 13% cedar	

Exterior Wood Ltd. - Stan Bishoprick	Surrey	15	Lumber, decking, PWF, timbers plywood, fencing, plywood landscaping, shakes and shingles	CCA	45 Mfbm	--	USA, Pacific-Rim, Europe
Kootenay Wood Preservers Ltd. - M.G. Bildfell	Cranbrook	22	Lumber, timbers, posts, poles, PWF, plywood	CCA	72 Mfbm	--	USA
McFarland Cascade Pole Ltd.	New Westminster	--	--	--	--	--	--
MacMillan Bloedel - Wood Preserving Division - J.A. Brown	New Westminster	27	Poles, piling, lumber, plywood, timbers	CCA	6,531 cu. ft. per day	Cedar	--
Nardis Logging - Werner Diefenbach	Skookumchuk	20	Lumber, timber, shake and shingles, poles & piling	--	--	60% spruce, 40% pine, LPP & Ponderosa	USA
Prince George Wood Preservers - Wayne Kidd	Prince George	--	Lumber, plywood, timbers	--	10 MMfbm per year	--	USA, Japan Europe
Princeton Wood Preservers Ltd.	Princeton	10	Poles, piling, plywood, timbers	CCA	--	--	--
Summit Wood Preservers Ltd. - Bob Goode	Westwold	12	Lumber, posts, timbers	--	--	LPP aspen	USA
Western Wood Preservers - Richard de Lisse - Gordon Leontowich - Jim Powers	Aldergroove	15	Lumber, timber, rounds shakes and shingles, poles, piling, plywood	CCA - C50	2,400 cu. ft.	--	All

APPENDIX 3

CANADIAN TREATED WOOD STANDARDS

SPECIFICATION FOR	CSA STANDARD
General Requirements	
Purchase of Treated Wood Products	080.M1
Inspection of Treated Timber Products	080.M2
Quality Control Procedures for Wood Preserving Plants	080.M3
Care of Pressure Treated Wood Products	080.M4
Code for Engineering Design in Wood	CAN3-086-M
Round Wood Piles	CAN3-056-M
Procedure for Certification of Pressure Treated Wood Materials for Use in Preserved Wood Foundations	0322
Construction of Preserved Wood Foundations	CAN3-S406
Douglas Fir Plywood	0121-M
Canadian Softwood Plywood	0151-M
Wood Utility Poles & Reinforcing Stubs	CAN3-015-M
Pressure Treated Commodities	
Preservative Treatment by Pressure Processes:	
All Timber Products	080.1
Lumber, Timbers, Bridge Ties & Mine Ties	080.2
Piles	080.3
Poles	080.4
Posts	080.5
Cross ties and Switch ties	080.6
Plywood	080.9
Wood Blocks for Floors and Platforms	080.11
Wood for Highway Construction	080.14
Wood for Building Foundation Systems, Basements and Crawl Spaces	080.15
Pole Building Construction and Wood Used on Farms	080.16
Piles and Timbers in Marine Construction	080.18
Crossarms	080.25
Coast Region Douglas Fir and Western Hemlock Structural Glued-Laminated Members and Laminations Before Gluing	080.28
Fire-Retardant Treatment by Pressure Processes:	
Lumber	080.20
Plywood	080.27
Preservatives & Fire Retardants	
Creosote	080.P1, P13
Creosote-Petroleum Oil Solution	080.P3
Petroleum Oil for Blending with Creosote	080.P4
Water-borne Preservatives	080.P5
Hydrocarbon-borne Preservatives	080.P8
Solvents for Organic Preservative Systems	080.201-M

APPENDIX 4

AMERICAN WOOD PRESERVERS BUREAU (AWPB, STANDARDS FOR SOFTWOOD LUMBER AND PLYWOOD

For above ground use:

AWPB LP-2: Pressure treated with waterbourne preservatives.
AWPB LP-3: Pressure treated with light petroleum solvent pentasolution.
AWPB LP-4: Pressure treated with volatile petroleum solvent (LPG) penta solution.
AWPB LP-5: Pressure treated with creosote or creosote coal tar solution.
AWPB LP-7: Pressure treated with heavy petroleum solvent penta solution.

For ground contact use:

AWPB LP-22: Pressure treated with waterbourne preservatives.
AWPB LP-33: Pressure treated with light petroleum solvent penta solution.
AWPB LP-44: Pressure treated with volatile solvent (LPG) penta solution.
AWPB LP-55: Pressure treated with creosote or creosote coal tar solution.
AWPB LP-77: Pressure treated with heavy petroleum solvent penta solution.
AWPB FDN: All-Weather Wood Foundation system treated with waterbourne CCA or ACA preservatives.

For marine pile use:

AWPB MP-1: Standard for dual treatment of piling pressure treated with waterbourne preservatives and creosote for use in marine waters.
AWPB MP-2: Standard for marine piling pressure treated with creosote for use in marine waters.
AWPB MP-4: Standard for marine piling pressure treated with waterbourne preservatives.

APPENDIX 5

TREATMENT SYSTEMS/CHEMICAL NAMES/TRADES NAMES

	Common Name	Chemical Name	Chemicals	Trade Names
1. Waterborne salts	CCA Type A	Copper Chrome Arsenate	Arsenic pentoxide, copper sulphate and potassium dicthiromate	Erdalith
	CCA Type B	Copper Chrome Arsenate	Arsenic acid, chromic acid, copper oxide and water	Boliden Koppers CCA-B Osmose K-33
	CCA Type C	Copper Chrome Arsenate	Arsenic acid, chromic acid copper oxide and water	Chrome-Ar-Cu (CAC) Langwood Osmose K-33 Wolman Wolmanoe Wood Last
	ACA	Ammoniacal Copper Arsenate	Acetic acid, arsenic trioxide copper hydroxide and water	Chemoxite
	CZC	Chromated Zinc Chloride		
	FCAP-Type A	Fluor Chrome Arsenate Phenol	Dinitrophenol, sodium arsenate, sodium chromate and sodium fluoride	Wolman Salts FCAP Wolman Salts FMP Tanalith
	FCAP-Type B	Fluor Chrome Arsenate Phenol	Dinitrophenol, sodium arsenate, sodium dichromate and sodium fluoride	Osmosalt Osmosar Osmose
	AAC	Acid Copper Chromate		Celcure

2. Oilborne systems	PCP	Pentachlorophenol	Penta
	TCP	Tetrachlorophenol	Tetra
	Na TCP	Sodium Tetrachlorophenol	
3. Creosote or creosote petroleum mixtures	---	---------	---------

APPENDIX 6

TREATED WOOD - MARKET NAMES

All Weather Wood (CCA system by Timber Specialties Ltd.)

Duratan, Durawood

Greatwood

Flamefree (shakes and shingles fire retardant)

PermaPost, Permashingle

Permacised (incising by Timber Specialties Ltd.)

Sunwood

Wolman (CCA system by Koppers Ltd.)

Outdoor wood (CCA system by Koppers Ltd.)

C-50 (CCA system by Timber Specialties Ltd.)